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RESEARCH PAPER

Ash weevil *Myllocerus* spp. dominates *Helicoverpa armigera* in *Kharif* groundnut systems

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Abstract : Redgram, castor, cowpea and field bean were grown as intercrops to study the population dynamics of *Helicoverpa* and *Myllocerus* spp in groundnut under rainfed conditions. Groundnut + redgram, groundnut + castor, groundnut + cowpea and groundnut + field bean were raised at 7:1, 7:1, 6:1 and 6:1 ratios, respectively along with pure crop of groundnut. Groundnut +cowpea and groundnut + redgram intercropping systems recorded less mean per cent damaged leaves by *Helicoverpa* (4.06 and 4.69%). The damage was found to be increased gradually and reached maximum of 7.80 mean per cent at 60 DAS *i.e.* during Ist FN of September, thereafter slightly declined. However, the leaf damage by *Helicoverpa* has not reached ETL (20% damaged leaves) in the season. Leaf damage by ash weevil was started at 20 DAS *i.e.* during IInd FN of July which was gradually increased and reached peak (24.19 %) at 60 DAS *i.e.* during I FN of September and thereafter it was declined. Per cent leaf damage by *Myllocerus* spp. was comparatively less in groundnut + cowpea system (12.48 %). Whereas damage in remaining treatments ranged from 15.0 to 22.0 per cent. However, irrespective of intercrops, on groundnut, Ash weevil damage was higher than other leaf eaters including *Helicoverpa*.

Key Words : Groundnut, *Myllocerus* spp., *Helicoverpa armigera*, Intercropping

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INTRODUCTION

Self-sustaining, low-input and energy-efficient agricultural systems in the context of sustainable agriculture have always been in the centre of attention of many farmers and researchers worldwide (Altieri, 2003). However, most practices of modern agriculture, e.g. mechanization, monocultures, improved crop varieties, and heavy use of agrochemicals for fertilization and pest management, led to a simplification of the components of agricultural systems and to a loss of biodiversity. Restoring on-farm biodiversity through diversified farming systems that mimic nature is considered to be a key strategy for sustainable agriculture (Scherr and McNeely, 2008). On-farm biodiversity, if correctly assembled in time and space, can lead to agroecosystems capable of maintaining their own soil fertility, regulating natural protection against pests, and sustaining productivity (Scherr and McNeely, 2008).

Biodiversity in agroecosystems can be enhanced in time through crop rotations and sequences in space through intercropping, cover crops and agroforestry (Malezieux *et al.*, 2009). Intercropping is one of the important cultural practices in pest management and is based on the principle of reducing insect pests by increasing the diversity of an ecosystem.

The impact of growing of groundnut with intercrops on the incidence of *Helicoverpa armigera* and *Myllocerus* spp. was studied and the results are presented below.

MATERIAL AND METHODS

A field experiment was conducted during 2011 *Kharif* season with the groundnut variety Narayani at wetland farm,

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S.V. Agricultural College, Tirupati. A Randomized Block Design (RBD) was laid with five treatments replicated four times in a plot size of 10m × 5m. The treatments consisted of growing one row of red gram after every seven rows of groundnut (1:7), one row of castor (local variety) after every seven rows of groundnut (1:7), one row of cowpea (TPTC-8) after every six rows of groundnut (1:6), one row of field bean (TFB-5) after every six rows of groundnut (1:6) and a pure crop of groundnut. All agronomic practices from sowing to harvesting were followed. The trial received no plant protection measures.

Incidence of *H. armigera* was recorded at 10 days interval starting from 40 DAS interms of per cent leaves damaged. Five plants were randomly selected in each replication of treatments, number of larvae and damaged leaves were counted on those plants. Then, per cent damaged leaves were calculated by using the affected leaves and total number of leaves. Observations on incidence of *Myllocerus* spp. was made from 20 DAS by counting the total number of leaves and number of damaged leaves. (Four leaflets of groundnut were considered as one leaf).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Incidence of *Helicoverpa armigera* and *Myllocerus* spp. (in terms of leaf damage) :

At 40 days after sowing :

Helicoverpa :

Less leaf damage was noticed in groundnut + cowpea intercropping system (3.23%) followed by groundnut + redgram intercropping system (3.56%). Relatively, the damage was high in pure crop of groundnut *i.e.* 6.49 per cent. In groundnut + castor and in groundnut + field bean systems 6.04 per cent and 4.33 per cent damage was noticed (Table 1).

Table 1 : *H. armigera* damage in different intercropping systems of *Kharif* groundnut

Treatments	Per cent of leaf damage / plant *						Mean
	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS	
Groundnut + redgram	3.56 (7.52)^{ab}	5.56 (10.91)^{ab}	6.26 (11.58)^{ab}	4.73 (10.01)^{ab}	4.18 (9.40)^{a}	3.88 (9.05)^{ab}	4.69 (9.75)^{a}
Groundnut + castor	6.04 (11.26)^{cd}	6.90 (12.11)^{b}	8.6 (13.52)^{bc}	7.48 (12.44)^{bc}	6.05 (11.35)^{ab}	4.62 (9.86)^{ab}	6.62 (11.76)^{ab}
Groundnut + cowpea	3.23 (7.10)^{a}	4.62 (9.82)^{a}	5.39 (10.55)^{a}	3.5 (8.61)^{a}	4.13 (9.35)^{a}	3.50 (8.62)^{a}	4.06 (9.01)^{a}
Groundnut + field bean	4.33 (9.53)^{bc}	6.36 (11.61)^{ab}	7.97 (12.94)^{abc}	4.95 (10.16)^{ab}	5.25 (10.49)^{a}	5.72 (10.98)^{bc}	5.76 (10.95)^{ab}
Groundnut alone	6.49 (11.80)^{d}	7.04 (12.23)^{b}	10.8 (15.33)^{c}	8.46 (13.40)^{c}	8.48 (13.46)^{b}	7.8 (12.91)^{c}	8.18 (13.19)^{b}
Mean	4.73 (9.44)	6.09 (11.34)	7.80 (12.79)	5.8 (10.92)	5.62 (10.81)	5.10 (10.28)	5.86 (10.93)
S.E. ±	0.62	0.77	1.04	1.15	0.784	0.762	1.18
C.D. (P=0.05)	2.1	2.26	2.8	3.0	2.41	2.35	3.01

Figures in parenthesis indicates angular transformed values.
*= Average of 5 plants

Table 2 : Ash weevil (*Myllocerus* spp.) damage in different intercropping systems of *Kharif* groundnut

Treatments	Per cent of leaf damage / plant *								Mean
	20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS	
Groundnut + redgram	8.42	16.59	19.98	23.56	25.32	22.39	18.44	15.54	18.78^{cd}
	(13.24)^{ab}	(20.65)^{bc}	(22.29)^{bc}	(26.25)^{cd}	(29.59)^{c}	(24.33)^{c}	(21.41)^{bc}	(18.94)^{bc}	(22.09)
Groundnut + castor	6.6	13.65	15.31	18.33	22.10	19.24	16.63	13.59	15.68^{b}
	(11.8)^{ab}	(19.05)^{ab}	(21.39)^{ab}	(23.05)^{b}	(24.05)^{b}	(20.48)^{b}	(19.03)^{b}	(17.03)^{b}	(19.40)
Groundnut + cowpea	5.79	9.23	11.51	15.96	18.92	16.53	13.57	8.38	12.48^{a}
	(11.09)^{a}	(16.66)^{a}	(17.96)^{a}	(19.33)^{a}	(20.38)^{a}	(15.92)^{a}	(14.85)^{a}	(13.41)^{a}	(16.20)
Groundnut + field bean	6.9	14.14	16.66	20.68	24.26	20.99	18.90	14.23	17.09^{bc}
	(11.9)^{ab}	(19.43)^{b}	(21.59)^{b}	(24.11)^{bc}	(26.19)^{b}	(20.26)^{b}	(19.28)^{bc}	(17.68)^{b}	(20.05)
Groundnut alone	9.16	18.88	22.94	26.86	29.99	26.84	23.35	19.99	22.25^{d}
	(13.9)^{b}	(22.69)^{c}	(25.74)^{c}	(27.89)^{d}	(31.05)^{c}	(27.45)^{d}	(21.43)^{c}	(20.26)^{c}	(23.80)
Mean	7.37	14.49	17.28	21.07	24.19	21.19	18.18	14.35	17.26
	(12.37)	(19.69)	(21.79)	(24.12)	(26.25)	(21.68)	(19.20)	(17.46)	(20.31)
S.E. ±	1.12	1.13	1.49	1.44	1.3	1.11	1.10	1.06	1.19
C.D. (P=0.05)	2.46	2.50	3.59	2.68	2.65	2.40	2.39	2.29	2.20

Figures in parenthesis indicates angular transformed values.
*= Average of 5 plants

Ash weevil :

The damage due to ash weevil in different plots at 40 DAS increased when compared to the damage at 20 and 30 days after sowing. In groundnut + cowpea, groundnut + castor and groundnut + field bean the damage caused by the weevil was 11.51 per cent, 15.31 per cent and 16.66 per cent, respectively. In pure crop and in groundnut + redgram 22.94 per cent and 19.98 per cent damaged leaves were observed, respectively (Table 2).

At 50 days after sowing :
Helicoverpa :

The damage by *Helicoverpa armigera* slightly raised from 3.0 to 6.0 per cent to 4.0 to 7.0 per cent in all the systems (Table 1).

Ash weevil :

The damage was increased. Groundnut + cowpea recorded 15.96 per cent and groundnut + castor, 18.33 per cent. Higher per cent damage by ash weevil was noticed in sole crop of groundnut, groundnut + redgram and groundnut + field bean systems *i.e.* 26.86 per cent, 23.56 per cent and 20.68 per cent, respectively (Table 2).

At 60 days after sowing :
Helicoverpa :

The *H. armigera* damaged leaves were 6.3 to 8.6 per cent in intercropping patterns where as in sole, 11.0 per cent damaged leaves were noticed. Even though per cent damage was high at this stage, but it is not reached up to ETL (Table 1).

Ash weevil:

High leaf damage due to ash weevil was noticed in all the intercropping systems. Groundnut + cowpea recorded 18.92 per cent followed by groundnut + castor intercropping system *i.e.* 22.10 per cent which was at par with groundnut + field bean intercropping system *i.e.* 24.26 per cent. Groundnut grown as sole crop and groundnut + redgram had 25.0 to 30.0 per cent damaged leaves (Table 2).

At 70, 80 and 90 days after sowing :
Helicoverpa :

Some reduction was observed in Helicoverpa leaf damage in all the treatments (Table 1).

Ash weevil:

There was slight reduction in leaf damage at 70 DAS. In sole groundnut and groundnut + redgram, 22.0 to 27.0 per cent damaged leaves were noticed and in remaining plots 16.0 to 20.0 per cent damaged leaves were seen. 2.0 to 4.0 per cent less damaged leaves were recorded at 80 DAS when compared to damage at 70 DAS. At 90 DAS, still reduction in leaf damage was noticed. In groundnut + cowpea, groundnut + castor, groundnut + field bean leaf damage was 8.38, 13.59 and 19.99 per cent, respectively. In sole groundnut, the damage was 19.99 per cent and in groundnut + redgram it was 15.54 per cent (Table 2).

H. armigera incidence started at 40 DAS *i.e.* during IInd FN of August. Per cent leaf damage was found to be increased gradually and reached maximum of 7.80 mean per cent at 60 DAS *i.e.* I FN of September (Table 3). Thereafter, the damage was slightly declined. Pest preference for tenderness of the crop may be the reason for above observations. The damage has not reached ETL (20% damaged leaves) in the season.

Leaf damage by ash weevil actually was started at 20 DAS and reached peak (21.19 %) at 60 DAS *i.e.* during Ist FN of September and thereafter it was declined. Fluctuations in minimum temperature from 23 to 27°C and decrease in relative humidity 80 per cent to 65 per cent might have negatively

Table 3 : Average incidence of *H.armigera and Myllocerus* at different intervals

Days after sowing	leaf damage by *H. armigera* (%)	leaf damage by *Millocerus* (%)
40(II FN of August)	4.73	17.28
50(II FN of August)	6.09	21.07
60 (I FN of September)	7.80	21.19
70 (I FN of September)	5.80	18.18
80 (II FN of September)	5.62	14.35
90 (I FN of October)	5.10	17.26

Table 4 : Overall damage done by test insects in different intercropping systems

Treatments	leaf damage by *H. armigera* (%)	leaf damage by *Myllocerus* (%)
Groundnut + redgram	4.69	17.28
Groundnut + castor	6.62	21.07
Groundnut + cowpea	4.06	21.19
Groundnut + field bean	5.76	18.18
Groundnut alone	8.18	14.35

favored ash weevil. Matured leaves of groundnut crop may not be preferred by weevil.

The leaf damage due to *H. armigera* in five different intercropping systems ranged from 4.06 to 8.18 per cent (Table 4). The damage was less in groundnut + cowpea intercropping system (4.06%), followed by groundnut + redgram (4.69%). Pure crop of groundnut recorded almost double the damage than the above two systems. groundnut + castor system and groundnut + field bean systems resulted in 5.0 to 7.0 per cent.

With respect to Ash weevil, groundnut + cowpea system had comparatively less damage (12.48%) whereas damage in remaining treatments ranged from 15.0 to 22.0 per cent.

The micro climate prevailed in the crop canopy of cowpea may not be that much favourable to *Helicoverpa* and Ash weevil. Feeding inhibition odours from cowpea may reduce the damage by the insects.

However, irrespective of intercrops, Ash weevil damage was higher than other defoliators. This is the first record of Ash weevil as major defoliator of groundnut in India.

The present findings are supported by Shantipriya and Misra (2007) who reported that grey weevil *Myllocerus maculosus* is attaining major pest status in cotton and they recommended some chemicals to control the pest. Muthiah *et al*. (2003) who have reported that the damage by *H. armigera* on groundnut at 50 days after sowing was lesser when it was intercropped with castor, pearl millet and black gram than in pure crop of groundnut. Ranga Rao *et al.* (2007) also reported that growing of cowpea or castor or sunflower as intercrops in groundnut reduce the damage caused by the *Helicoverpa armigera.*

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